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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
08/811,742	03/06/1997	HONGYONG ZHANG	0756-1641	1505

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EXAMINER

NGUYEN, KHIEM D

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 11/18/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

08/811,742

Applicant(s)

ZHANG ET AL.

Examiner

Khiem D Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 19 August 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 5-12, 16, 19, 26-48 and 67-75 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 5-12, 16, 19, 26-48 and 67-75 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 49. 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5-8, 11-12, 16, 19, 27-48 and 67-75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oka (JP '915) in combination with Liu et al. (US '826) and in combination with Kuznetsov (Inst. Phys. Conf) and in combination with Kumomi.

Oka discloses a method of manufacturing a semiconductor device for the formation of an active matrix type electro-optical display having a driving circuit portion and display portion comprising the steps of forming an amorphous Silicon layer on a glass substrate by PECVD (pg. 6, translation), selectively forming a Ni layer (pg. 14, translation) of a thickness of 100-200 Angstroms on a-Si layer in seed regions outside the regions slated to become TFT active regions, such that Ni does not diffuse into said active regions by abnormal diffusion. Therefore, the Ni is introduced into the seed regions by solid source diffusion. The method further discloses thermally heating the Ni at 450 C° (pg. 6, translation) such that the Ni catalyst would diffuse through the semiconductor film forming crystal nuclei near the interface between the metal layer and the a-Si layer (pg. 7, translation). After diffusion of the catalyst through the semiconductor film, the metal layer is removed to prevent abnormal diffusion (i.e. diffusion into the active layer of the TFT as defined pg. 7 of translation). The method also

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includes formation of semiconductor islands (fig. 2b) comprising of a first region and the formation of a semiconductor island comprising of a second region. Examiner previous official notice was not adequately contested, therefore, it is taken as admitted prior art that the formation of semiconductor islands is notoriously obvious in the art in order to provide device isolation.

Kuznetsov teaches that metal catalyst induced crystallization occurs by lateral diffusion of the metal throughout the a-Si film. In addition, Kuznetsov teaches a concentration of Ni<sup>+</sup> ions to a maximum concentration of about  $1.5 \times 10^{20}$  atoms/cm<sup>3</sup>. (pg. 191-194) Thus, such diffusion, while not explicitly taught by Oka, is inherent in the process of Oka as a result of the metal induced lateral crystallization. In reference to amended claims 27, 31, 33, 36, 42, 45, and 47, a-Si is then thermally crystallized at 550 C°, where the grain nuclei ordinarily formed in the seed regions and grain growth proceeds from said seed regions parallel to the substrate surface and TFT charge carrier flow (fig. 5-8). TFTs are subsequently formed in the crystal growth region. Thus, the thin film transistor is inherently arranged such that the crystals extend along a direction which connecting source and drain regions of the thin film transistor.

Oka does not explicitly anticipate leaving areas of the film amorphous.

However, Liu teaches forming regions of a-Si on Corning 7059 glass and some of the regions that were not treated with Ni prior to a low temperature thermal treatment remain amorphous, while a-Si regions that were treated with Ni are crystallized into polysilicon after said thermal treatment (Example 2). Liu teaches the selective crystallization of certain regions is advantageous because it allows simultaneous

formation of driver TFTs that require a low leakage current in the amorphous regions (col. 3, lines 10-17).

Therefore it would have been obvious to one of ordinary skill in the requisite art to leave a second region (disposing nickel in contact with a selected region of only the first region of the semiconductor film) of Oka amorphous by not providing a seed region. One of ordinary skill in the art at the time of the invention would have been motivated by Liu's teachings. That is in order to simultaneously obtain driver TFTs of high mobility in the polysilicon regions and pixel TFTS, which require a low leakage current in the amorphous regions. Therefore, Oka would have been motivated to incorporate these teachings of Liu for there disclosed intended purpose.

Kumomi teaches MILE or catalyst enhanced areas crystal growth takes place parallel to the substrate (e.g. MILC). It is held, absent evidence to the contrary, that crystal growth of Oka would occur by this mechanism, as it is a fundamental characteristic of the process. See *In re Best*, 195 USPQ 428 (CCPA 1977) and *In re Fitzgerald*, 205 USPQ 594 (CCPA 1980).

2. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oka (JP'915), in combination with Liu et al. (US '826) and in combination with Kuznetsov (Inst. Phys. Conf) and in combination with Kumomi as applied to claims 5-8, 11-12, 16, 19, 27-48 above, and further in view of Yonehara (US '093) and/or Shibata (US '224 or JP ' 224).

Oka and Liu lack anticipation for irradiating the polysilicon after the thermal crystallization.

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Yonehara and/or Shibata teach the irradiating the polysilicon after a thermal crystallization in order to improve the properties of the film, such as mobility. It would have been obvious to one of ordinary skill in the art to irradiate the polysilicon of Oka and Liu after the thermal crystallization in order to improve its mobility as taught by Yonehara and/or Shibata.

3. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oka (JP '915) in combination with Liu et al. (US '826) and in combination with Kuznetsov (Inst. Phys. Cono and in combination with Kumomi as applied to claims 5-8, 11-12, 16, 19, 27-48 above and further in view of Kuznetsov.

Kuznetsov teaches determining Ni concentration in metal induced crystallized silicon using SIMS (sec. 2)

Therefore, it would have been obvious to one of ordinary skill in the requisite art to test the metal induced crystallized silicon of Oka or catalyst containing material of Oka by SIMS to check for the presence of and to determine the distribution of deleterious metal impurities (Oka, pgs. 10- 11 of translation) as taught by Kuznetsov.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D Nguyen whose telephone number is (703) 306-0210. The examiner can normally be reached on Monday-Friday (8:00 AM - 5:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chaudhuri Olik can be reached on (703) 306-2794. The fax phone numbers

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for the organization where this application or proceeding is assigned are (703) 746-9179 for regular communications and (703) 746-9179 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

K.N.

November 11, 2002

A handwritten signature in black ink, appearing to be "VH" followed by a stylized name.